

# Unit 11: Systems Analysis and Design

<b>Unit code:</b>	<b>F/601/7278</b>
<b>QCF Level 3:</b>	<b>BTEC National</b>
<b>Credit value:</b>	<b>10</b>
<b>Guided learning hours:</b>	<b>60</b>

## ● Aim and purpose

The aim of this unit is to enable learners to gain an understanding of the principles of systems analysis and equip them with the skills to analyse business requirements and design solutions to meet business needs.

## ● Unit introduction

Systems analysis informs the development of large or small, but often complex, systems and the interactions within those systems. It provides structured processes that help to ensure designs are reliable.

In this unit, learners will gain an understanding of the principles and stages involved in systems analysis and the associated documentation involved in both the analysis and design stages. One key stage involves the determination of requirements and the writing of the requirements specification. Clear statements and understanding of the requirements are essential to ensuring that an appropriate solution is designed. In addition, the specification will provide the basis for later testing and evaluation.

The unit looks at why organisations undertake systems analysis as well as the benefits of carrying out such a formal process. A wide variety of methodologies are used, however they are all based on similar fundamental principles.

Learners will become familiar with a limited number of lifecycle models and the associated terminology involved in the analysis and investigation of a system.

Learners will develop a detailed knowledge and understanding of different methodologies and their benefits and uses in particular situations.

It is expected that learners will undertake an actual systems analysis and design activity. It is not expected, however, that learners will create the system or test it as part of this unit. Other units can be linked to this unit to carry through the design work to the implementation stage.

## ● Learning outcomes

**On completion of this unit a learner should:**

- 1 Understand the principles of systems analysis and design
- 2 Be able to carry out a structured analysis of business systems requirements
- 3 Be able to design business systems solutions.

# Unit content

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## 1 Understand the principles of systems analysis and design

*Principles:* development lifecycle models; developmental tools and techniques; key drivers

*Development lifecycle models:* Waterfall; other eg Spiral, Rapid Applications Development (RAD); benefits; stages eg initiation and feasibility, investigation, requirements analysis and specification, design (logical and physical), build systems, testing, implementation, maintenance

*Developmental tools and techniques:* any contemporary methodology for systems analysis and design; typical eg activity diagrams, dataflow diagrams, computer-aided software engineering tools (CASE)

*Key drivers:* business need, eg need for growth, company acquisition, need to increase productivity, legal requirements

*Structured analysis:* benefits eg reduced risk of projects running over-budget or over-time, good quality software that meets requirements, manageable projects, maintainable systems and code, resilient systems

## 2 Be able to carry out a structured analysis of business systems requirements

*Investigation:* techniques eg interview, questionnaire, meeting, observation, document analysis, data analysis; sensitivity in collecting information and observing individuals at work

*Analysis:* as related to the chosen methodology; cost benefit analysis

*Requirements specification:* contents eg scope, inputs, outputs, processes, costs and benefits, recommendations, alternative solutions

## 3 Be able to design business systems solutions

*Design:* inputs and outputs eg screens and report design; data eg data flow diagrams, data dictionaries, entity relationship diagrams; process descriptors eg decision tables, flow charts, structured English

*Constraints:* on the design eg costs, organisational policies, timescale, legacy systems, available hardware platforms

## Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<b>P1</b> outline the principles of systems analysis		
<b>P2</b> illustrate the stages of a development lifecycle	<b>M1</b> discuss the most appropriate uses of different development lifecycle models	
<b>P3</b> explain the benefits of structured analysis		
<b>P4</b> carry out a structured analysis of a specified business process [IE2]		
<b>P5</b> produce a requirements specification for a business process [CT 1]	<b>M2</b> suggest alternative solutions	<b>D1</b> analyse costs and benefits
<b>P6</b> produce a design for a specified system requirement. [CT 1]	<b>M3</b> explain any constraints on the system design.	<b>D2</b> generate comprehensive design documentation independently.

**PLTS:** This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

# Essential guidance for tutors

## Delivery

Emphasis should be placed on developing learners to understand the role and principles of systems analysis and design, including the creation of clear documentation and the reasons behind the development of lifecycle methodologies. Systems analysis is a hard concept for learners to grasp and without an understanding of why it is necessary, for example to carry out a cost benefit analysis or produce a data flow diagram; learning can become unrelated and 'difficult'.

Unless the centre has access to a variety of employers who can provide opportunities and information that can be used for assessment purposes, it is likely that much of the learning will be based on case studies. Where possible, case studies should be detailed and learners should be able to pose questions that allow them to gain further insights and access the higher grades.

A 'bite size' approach could work well, although a general overview of the whole process should be used to introduce the subject. The individual elements of the systems lifecycle can then be covered. Some theory about different models and methodologies needs to be included.

Learners will need to practise for all stages and a sufficient amount of time should be allocated. While the stages beyond design should be covered as outlined in the unit content, these elements are not assessed. Assessment of building and testing systems occurs in other units. Linking this unit to others such as *Unit 18: Database Design* could aid teaching and learning and give learners a more holistic experience.

## Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
<b>Introduction to the unit</b>
Principles of systems analysis and design: <ul style="list-style-type: none"><li>• whole-class exercise – tutor presentation giving an overview of stages, ie investigation (interview etc); feasibility study; requirements analysis; system specification (design); system build (software solution); testing; implementation; maintenance</li><li>• a mixture of tutor-led sessions, directed learning and talks.</li></ul>
Structured analysis: <ul style="list-style-type: none"><li>• whole-class exercise – tutor presentation on investigation, followed by individual exercise</li><li>• whole-class exercise – tutor presentation on feasibility study and requirements analysis, followed by individual exercise</li><li>• a mixture of tutor-led and directed learning, case studies, role play, speakers.</li></ul>
<b>Assignment 1 – What Is Systems Analysis?</b>

## Topic and suggested assignments/activities and/assessment

Principles of systems analysis and design 2:

- whole-class exercise – tutor presentation on systems specification, followed by individual exercise
- whole-class exercise – tutor presentation on documentation (DFDs, structured English etc), followed by individual exercise
- whole-class exercise – tutor presentation on constraints, followed by individual exercise
- a mixture of tutor-led and directed learning, case studies, active learning exercises.

### Assignment 2 – What Do We Need?

Models and methodologies:

- individual exercise – directed research into lifecycle models
- individual exercise – directed research into tools and techniques
- group exercise – discussion on reasons and benefits
- a mixture of tutor-led and directed learning, case studies, active learning exercises.

### Assignment 3 – And the Solution Is ...

## Assessment

It is suggested that this unit is assessed using three assignments as summarised in the *Programme of suggested assignments* table.

Learners will need a scenario or case study detailing an organisation's (real or invented) activities. It is important that the scenario is as broad as possible to enable learners to meet all the assessment criteria. If at all feasible it would be beneficial for them to carry out their own research with a suitable organisation.

The scenario suggested here is that of a small delivery business whose database system is outdated and staff have reverted to semi-manual systems. Deliveries are being delayed or, worse, completely missed. The business has employed a systems analyst to investigate the requirement and design a system to meet these needs.

### Suggested Assignment 1 – What Is Systems Analysis?

The suggested scenario for this theoretical element of the assessment is a presentation to a group of new BTEC IT learners to introduce the subject of systems analysis. Learners need not deliver the presentation, it may be produced as a self-running or interactive presentation, as long as the content is clear and sufficient and meets the grading criteria.

P1 requires an explanation of the principles of systems analysis. The unit content will inform the content.

For P2, learners need only outline the stages of one development lifecycle but for M1, they must consider other models and why different models are used. This should be supported by examples.

In explaining the benefits of systems analysis for P3, learners should start with the key drivers and use the unit content as a guide.

### Suggested Assignment 2 – What Do We Need?

For P4, it is expected that learners will have used appropriate techniques to gather the information they need to produce a requirements specification. A scenario that allows for the gathering of multiple responses (eg a customer or staff survey) would enable learners to develop questionnaires as well as using interviews. Evidence can be in the form of witness statements, interview notes and completed questionnaires.

P5 is the requirements specification. This will contain elements as appropriate to the chosen methodology and must give a clear picture of the inputs, outputs, processes, scope and constraints of the system requirement, with a recommended solution.

For M2, alternative solutions should be suggested with valid reasons for their inclusion.

For D1, learners should include an analysis of costs and benefits. This does not need to include precise costs but all elements that should be factored into a cost benefit analysis must be included.

### Suggested Assignment 3 – And the Solution Is ...

Following the requirements analysis, learners must now produce detailed design documentation. Again this will depend on the methodology used and may include, for example, data flow diagrams, ERDs, top-down design, structured English. For P6, it should be clear from the documentation how a basic solution would be implemented.

For M3, there should be an explanation of any constraints on the system design and for D2, learners should have worked independently, and produced thorough and detailed documentation.

### Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1 -P3, M1	What Is Systems Analysis?	Explain to a new group of BTEC IT learners what systems analysis is all about.	Presentation Handouts
P4, P5, M2, D1	What Do We Need?	A small delivery business needs a new database system. You have been asked to investigate and document the system requirement.	Feasibility report/ requirements specification (or similar) Witness statements Observation records
P6, M3, D2	And the Solution Is ...	Following the initial investigation and approval of your recommendation by the business managers, you are to produce detailed design documentation.	Design documentation, eg DFDs, ERDs

## Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC in IT sector suite. This unit has particular links with the following unit titles in the IT suite:

Level 2	Level 3	Level 4
		Unit 9: Systems Analysis and Design

This unit maps to some of the underpinning knowledge from the following areas of competence in the Level 2 National Occupational Standards for IT (ProCom):

- 4.4 Systems Analysis
- 5.1 Systems Development.

### Essential resources

Learners will need access to industry-standard software, plus hardware capable of running the software (including a printer).

### Indicative reading for learners

#### Textbooks

Dennis A and Wixom B – *Systems Analysis and Design, 4th Edition* (John Wiley and Sons, 2009)  
ISBN-10 0470400315, ISBN-13 978-0470400319

Yeates D and Wakefield T – *Systems Analysis and Design, 2nd Edition* (FT Prentice Hall, 2003)  
ISBN-10 0273655361, ISBN-13 978-0273655367

#### Websites

[www.freetutes.com/systemanalysis](http://www.freetutes.com/systemanalysis)

[www.tutorialized.com/view/tutorial/Systems-Analysis/31659](http://www.tutorialized.com/view/tutorial/Systems-Analysis/31659)

## Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
<b>Independent enquirers</b>	carrying out a structured analysis of a specified business process
<b>Creative thinkers</b>	producing a requirements specification for a business process producing a design for a specified system requirement.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
<b>Independent enquirers</b>	explaining any constraints on the system design analysing costs and benefits
<b>Creative thinkers</b>	discussing the most appropriate uses of different development lifecycle models suggesting alternative solutions.



## ● Functional Skills – Level 2

Skill	When learners are ...
<b>ICT – Using ICT</b>	
Plan solutions to complex tasks by analysing the necessary stages	carrying out a structured analysis of a specified business process
Select, interact with and use ICT systems safely and securely for a complex task in non-routine and unfamiliar contexts	generating design documentation
<b>ICT – Finding and selecting information</b>	
Use appropriate search techniques to locate and select relevant information	researching models and methodology
<b>ICT – Developing, presenting and communicating information</b>	
Use appropriate software to meet the requirements of a complex data-handling task	producing a design for a specified system requirement
Combine and present information in ways that are fit for purpose and audience	generating comprehensive design documentation independently
<b>English – Reading</b>	
Read and understand a range of straightforward texts	carrying out a structured analysis of a specified business process
<b>English – Writing</b>	
Write a range of texts, including extended written documents, communicating information, ideas and opinions, effectively and persuasively	<ul style="list-style-type: none"> <li>outlining the principles of systems analysis</li> <li>illustrating the stages of a development lifecycle</li> <li>explaining the benefits of structured analysis</li> <li>explaining any constraints on the system design.</li> </ul>